

# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

### DRAWINGS ATTACHED

#### Improvements in Dynamic Balancing Means

We, PLOWRIGHT BROTHERS LIMITED, of Brampton Manor, Chesterfield, Derbyshire, a British Company, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention is concerned with dynamic balancing means for use with rotating shafts which can have alternatively eccentric or concentric bearing journals and are used to produce positive vibrations in particular machines.

In certain types of machinery, say for example a vibrating screen, a vibrating motion is required. This motion can normally be obtained by either an eccentric rotating shaft positively engaging the screen which has a counter-balance fitted in order to minimise the out of balance forces created, or alternatively, a concentric rotating shaft fitted with an eccentric in order to create a vibratory motion. The eccentric shaft or the eccentric engages directly with the screen or a part secured thereto to produce the vibrations. In all such cases in which the weight and shape of the counter-balance is constant, and usually the position of the counterweight is fixed relative to the shaft, the counterweight has a constant radius of gyration, and from this the combined shaft and counterweight assembly has a constant compound polar moment of inertia. Because of these fixed conditions, the assembly of shaft, counterweight and screen is then only ideally suited to one set of speed and load conditions. Under other conditions undue out of balance forces are exerted by the screen, shaft etc., which create unsatisfactory operation, and power consumption is high.

It is therefore desirable to provide dynamic balancing means in the form of a counter-

weight which is automatically capable of taking up an appropriate and variable position relative to the shaft, and from this varying the radius of gyration of the counterweight and polar moment of inertia of the assembly, so as to tend to maintain dynamic balance of the machine as a whole at all speeds.

It is an object of the present invention to provide dynamic balancing means of the aforesaid type, and with this and other objects in view the invention comprises dynamic balancing means comprising a counterweight having a variable radius of gyration, consisting of a collar for attachment to a rotatable shaft, a pin extending radially therefrom and a weight slidably mounted on said pin and means for biasing the weight inwardly towards the collar comprising a helical spring surrounding the pin. If the counterweight and shaft assembly has a variable polar moment of inertia then the overall system will tend to retain dynamic balance at substantially all desired speeds. According to the invention the collar is attached to a rotating shaft and has a pin extending radially therefrom. A weight with a bore is slidably mounted on the pin and means such as for example a helical coil extension spring maintains the weight adjacent to the collar. As the shaft rotates, the weight is able to slide along the pin due to centrifugal force.

In order that the invention may be more readily understood reference will now be made to the drawing accompanying the Provisional Specification which illustrates diagrammatically and in section a counterweight according to the present invention.

In the Figure a rotatable shaft D forms part of a system in which it is desired to provide vibrational motion. A collar C is secured to the shaft D and has a pin B screw-

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Fig. 1

threaded therein to extend radially therefrom. A weight A is slidably mounted on the pin and is retained thereon by a truncated bush F.

- 10 A coil spring E secured on one end of the collar C and at the other end to the weight A is arranged to bias the weight adjacent to the collar C. As the shaft D rotates the weight A is able to slide along the pin B and thus the moment of inertia is altered and becomes adjusted according to the speed of rotation.

It will be appreciated that the present invention provides a simple and expedient form of counterweight having a variable moment of inertia.

WHAT WE CLAIM IS:—

1. Dynamic balancing means comprising

### PROVISIONAL SPECIFICATION

### Improvements in Dynamic Balancing Means

We, PLOWRIGHT BROTHERS LIMITED, a British Company, of Brampton Manor, Chesterfield, Derbyshire, do hereby declare this invention to be described in the following statement:—

This invention is concerned with a new or improved counterweight for use with rotating shafts which can have alternatively eccentric or concentric bearing journals.

In certain types of machinery, say for example, a vibrating screen, a vibrating motion is required. This motion can normally be obtained by either, an eccentric rotating shaft which has a counter-balance fitted in order to minimise the out of balance forces created, or alternatively, a concentric rotating shaft fitted with a counter-balance in order to create a vibratory motion, caused by the out of balance forces encountered. In all such cases in which the weight and shape of the counterbalance is constant, and usually the position of the counterweight is fixed relative to the shaft, the counterweight has a constant radius of gyration, and from this the combined shaft and counterweight assembly has a constant compound polar moment of inertia. Because of these fixed conditions, the assembly is then only ideally suited to one set of speed and load conditions. Under other conditions undue out of balance forces are exerted which create unsatisfactory operation, and power consumption is high.

It is therefore, desirable to provide a counterweight which is automatically capable of taking up an appropriate and variable position relative to the shaft, and from this varying the radius of gyration of the counterweight and polar moment of inertia of the assembly, so as to tend to maintain dynamic balance of the machine as a whole at all speeds, then an advantage will be obtained. It is an object of the present invention

a collar for attachment to a rotatable shaft, a pin extending radially therefrom, and a weight slidably mounted relative to the pin to have a variable radius of gyration when the said collar is rotated and means for biasing the weight inwardly towards the collar comprising a helical spring surrounding the pin.

2. Dynamic balancing means according to claim 1 wherein the weight has a bore through which the pin extends.

3. Dynamic balancing means substantially as described and illustrated herein with reference to the drawing accompanying the Provisional Specification.

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to provide a counterweight of the aforesaid type; and with this and other objects in view the invention comprises a counterweight having a variable radius of gyration, made up of a member for attachment to a rotatable shaft, a pin extending radially therefrom and a weight slidably mounted on said pin and having its centre line a constant radius at all points from the centre of the shaft. If the counterweight and shaft assembly has a variable polar moment of inertia then the overall system will tend to retain dynamic balance at substantially all desired speeds. The invention comprises a collar which is attached to a rotating shaft and having a pin extending radially therefrom. A weight with a bore is slidably mounted on the pin and means such as for example a helical coil extension spring maintains the weight adjacent to the collar. As the shaft rotates, the weight is able to slide along the pin due to centrifugal force.

In order that the invention may be more readily understood reference will now be made to the accompanying drawing which illustrate diagrammatically and in section a counterweight according to the present invention.

In the Figure a rotatable shaft D forms part of a system on which it is desired to provide vibrational motion. A collar C is secured to the shaft D and has a pin B screw threaded therein to extend radially therefrom. A weight A is slidably mounted on the pin and is retained thereon by the conical head of pin B.

A helical coil extension spring E secured on one end of the collar C and at the other end to the weight A is arranged to hold the weight adjacent to the collar C. As the shaft D rotates the weight A is able to slide along the pin B and thus the radius of gyration is

altered and becomes adjusted according to the speed of rotation.

It will be appreciated that the present invention provides a simple and expedient form of counterweight giving a variable

polar movement of inertia to the shaft assembly.

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1 SHEET

PROVISIONAL SPECIFICATION

*This drawing is a reproduction of  
the Original on a reduced scale.*

